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# PROCEEDINGS OF THE 1990 NORTHEASTERN RECREATION RESEARCH SYMPOSIUM

FEBRUARY 25-28, 1990

SARATOGA SPRINGS, NEW YORK



## **NORTHEASTERN RECREATION RESEARCH MEETING POLICY STATEMENT**

The Northeast Recreation Research meeting seeks to foster quality information exchange between recreation and travel resource managers and researchers throughout the Northeast. The forum provides opportunities for managers from different agencies and states, and from different governmental levels, to discuss current issues and problems in the field. Students and all those interested in continuing education in recreation and travel resource management are particularly welcome.

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The Steering Committee wishes to thank John Nelson for his assistance in developing the conference data base.

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RECREATION RESEARCH SYMPOSIUM**

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State Parks Management and Research Institute

Saratoga Springs, New York

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# AESTHETICS OF THE NORTHEASTERN FOREST: THE INFLUENCE OF SEASON AND TIME SINCE HARVEST <sup>1</sup>

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Individuals owning small woodlots have different management objective than corporate owners. Important among these is the forest's aesthetic value. This study investigates the effects of season and the time since harvest on the scenic quality northern hardwood sites. The seven sites studied range from one to thirteen years since being partially cut. Two controlled non-overlapping plots were photographed at each site during each season. Scenic quality evaluations of these scenes indicate that there is a cycle of change in scenic value after a woodlot is harvested. In addition, scenic evaluations are effected by both the season represented in the scene and the season during which the evaluation is made.

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## Introduction

To own a piece of land has become a permanent part of the American dream. Private individuals own approximately 60 percent of the U. S. commercial timberland. A major portion of these owners hold small woodlots. These woodlot owners are likely to place a high value on the amenity resources their land provides them: scenic quality, wildlife recreation, nature study, and the like.

For several reasons, individuals owning small woodlots are also less likely to place a high value on timber potential. Their land may be too small to divide into compartments that could be commercially harvested in rotation. When faced with the commercial decision to harvest their total holding, small owners may reasonably become concerned about the retention of their amenity

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<sup>1</sup> I thank Jeffry E. Penneston and Robert M. Sanford for their assistance in conducting this research project. This research was sponsored in part by the McIntire-Stennis Cooperative Forestry Research Program of the Forest Service, U.S. Department of Agriculture.

values. It can be expected that many small land owners lack accurate information about these effects. A very large percentage are businessmen or professionals without significant experiences with the effects of woodland management. This is particularly true in the urbanized Northeast. Their knowledge must necessarily be based on the cursory observation of sites they recognize as having been harvested; normally these would be recently harvested sites. Therefore, it is reasonable for them to take a cautious approach to protecting the amenity resources they feel are important to their well being. While it may be reasonable for government or corporate owners to accept 75 year rotations when managing their holdings, the typical adult woodlot owner has a much shorter personal life cycle during which she must reap whatever amenity values her land can provide. Page (1973) summarizes this perspective as follows:

But for the small landowner, the biggest factor in the acceptance of harvesting and management involves a combination of his concept of good utilization and the maintenance of an aesthetic appearance.

It is worth noting that Page is not an academic, but a forester working in Western Massachusetts.

The significance of woodlot owners has been recognized for some time (Christenson 1956). However, research tends to focus on the characteristics of landowners that are most favorably disposed toward timber harvesting (Royer, et al. 1983). The policy implied by this research would direct outreach efforts to encourage more of these owners to harvest their timber. An alternative research approach seeks to understand the value of woodlots to their owners and investigates the effects of harvesting on the amenity resources owners value so highly. The policy implied by this alternative provides landowners who typically would not be candidates for timber harvesting with more accurate information about the probable effects on the amenity resources they value most. The research reported here contributes to this alternative approach. It focuses on the seasonal scenic quality effects after various lengths of time since harvesting.

Small landowners will be most concerned with the visual effects from within their harvested woodlot. However, most research investigates the effects of harvested areas as seen in the middle or far distance (Chenoweth & Gobster 1986; Yoemans 1986). In addition, most research has been conducted in coniferous forests of the West, while a significant proportion of small landowners are from

the urban Northeast. Rutherford and Shafer (1969) studied the scenic value of uncut and 10- to 12-year old selection cut areas in Adirondack hardwood and softwood stands. Respondents from several diverse groups consistently preferred the cut to the uncut softwood scenes, while the cut and uncut hardwood scenes were equally preferred. Nyland's (1976) study of northern hardwoods in Central New York had inconclusive results concerning scenic value. However, the general trend seemed to be toward a preference for partial cutting rather than clearcut patches or strips, and a general negative sensitivity to the messy appearance of slash. Brush (1979) evaluated the scenic value of forested sites having various spatial characteristics, ranging from an open four-acre clearing bounded by a wall of trees to a dense popular thicket. He found that thinned well stocked stands were preferred over stands with noticeable recent harvest activity or dense overstocked stands. Hamilton et al. (1973) had similar findings from a survey of Central New York landowners. Both Brush and Hamilton conclude that there is a significant potential to improve forest scenic quality through active forest management.

Finally, owners will also be concerned with the effects of harvesting throughout the year, while research has focused almost exclusively on full foliage summer scenes. Calvin (1972) reports using scenes from all four seasons, but seasonal effects were not systematically investigated. Buhyoff and Wellman (1979) in a reanalysis of fall and summer scenes tentatively found seasonal differences, as well as an evaluation bias related to the time of year in which the evaluations were made. However, seasonal effects are not usually reported in the literature. For instance, Hamilton (1973) failed to comment on the mix of seasonal scenes shown in the photographs of his report.

## Methods

Seven northern hardwood sites are investigated. They were harvested with partial cuttings resulting in basal areas of between 50 to 90 square feet per acre. The sites range from one to thirteen years since harvest; a length of time within which an adult may reasonably expect full recuperation of any lost amenity resources. Two permanent plots were established on level areas of each site to allow the same views to be photographed during each season of the year. Photographs were taken on overcast days to minimize highly contrasting shadows. A single-lense reflex camera with a 35mm lense and Kodachrome film was used. The conditions represented by the four seasons are full-leaf

summer, partial fall color, snow covered winter, and leafless spring.

A ten point rating scale was used to measure scenic value. College juniors majoring in landscape architecture or environmental studies evaluated the scenes twice during the calendar year; once each season they evaluated those 14 scenes photographed during that season, and in early spring they evaluated all 56 scenes from all four seasons concurrently.<sup>1</sup> Between 89 and 111 students evaluated these scenes during each session; of these 27 students were identifiable as having evaluated all the scenes in all five evaluation sessions. Raw scores are used in the analysis in keeping with Schroeder's (1984) finding that "simple mean ratings produced results almost identical to more complicated scaling methods."

These data are used to conduct a balanced design analysis of variance investigating the scenic value relationships among:

- 4 seasons;
- 7 sites representing different lengths of time since harvest;
- 2 plots for site;
- 27 evaluators of scenic quality; and
- 2 evaluating sessions per scene, once in-season and the other concurrently.

In addition to these main effects, the interactive effects among season, time since harvest, and evaluators are investigated. The classic analysis of variance model is used in which all the effects are treated as fixed.

## Results and Discussion

The results of the analysis of variance are presented in Table 1.

Time since harvest and plot replication. Each of the seven sites represent a different length of time since harvest. While there is a highly significant difference among these sites, the lack of significance attributable to the plot replications indicate that evaluators are responding to site attributes rather than idiosyncratic characteristics in the photographs. The length of time since harvest and mean scenic value for each of the sites is

<sup>1</sup> Concern is frequently expressed by some about the use of students as evaluators. In forest scenic quality studies, students are normally found to have judgements similar to landowners or the general public (Brush 1979; Daniel & Boster 1976).



TABLE 1. An investigation of the effects of season and time since harvest on scenic value.

Source	Sums of Square	df	F	Signif.
Total	5802.9	757	3.6	.0001
Error	4866.7	2266		
Main Effects				
Time since harvest	411.7	6	32.0	.0001
Plot replication	1.3	1	0.6	.4428
Season	847.9	3	131.6	.0001
Evaluators	1670.6	26	29.9	.0001
Rep. of evaluation	25.6	1	11.9	.0006
Interactive Effects				
Season x Time	536.5	18	13.9	.0001
Season x Evaluator	869.5	78	5.2	.0001
Time x Evaluator	454.2	156	1.2	.0030
Sea. x Time x Eval.	985.6	468	1.0	.6016

presented in Table 2. A comparison of these means using the Scheffé test indicates that scenic value is low after harvest (1 to 3 years), but increases while the view remains open and slash degrades (4 to 6 years), and then slowly decreases as young growth becomes dense enough to obstruct the view (8 to 13 years). The mean scenic values in Figure 1 are from the in-season evaluations only. They show how well this general trend is summarized by a cubic curve.<sup>1</sup>

TABLE 2. Mean scenic value of various lengths of time since harvest.

Years since harvest	Mean scenic value	Scheffé test
1	6.14	**
3	5.91	**
4	6.75	**
6	6.85	**
8	6.02	**
12	5.88	**
13	6.11	**

*Note.* The Scheffé test provides a conservative indication that mean scenic values with an \*\* in the same column are not significantly different from each other at  $\alpha = .05$ .

<sup>1</sup> The least-squares estimate for this cubic curve is  $y = 5.11 + 0.78x - 0.12x^2 + 0.01x^3$ , where  $y$  = scenic value and  $x$  = time since harvest; the multiple correlation coefficient  $R = 0.21$ . This analysis was made using Cricket Graph (Rafferty & Norling 1986).

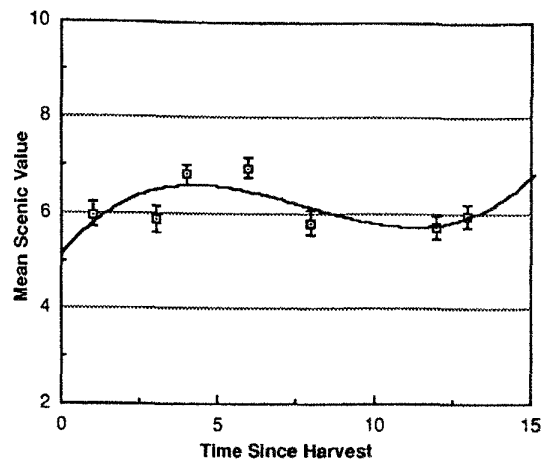


Figure 1. Mean scenic value bracketed by 95 percent confidence intervals for sampled times since harvest.

**Season and evaluation replication.** The scenic variations attributable to seasonal changes are highly significant, even though the view at each plot was carefully controlled to be the same each time it was photographed. The mean scenic values presented in Table 3 are both for the scenes as evaluated during the represented season and when evaluated concurrently during the spring. When scenes are evaluated during the same season in which they were photographed, winter views are thought to have the highest value. They are followed by summer and fall scenes, which do not have significantly different mean values. Finally, spring scenes have the lowest scenic value. It may be surmised from the general guidelines about woodland view preferences found in the literature (e.g. Hamilton et al. 1973; Nyland et al. 1976) that the snow covered scenes are preferred because of their clean, crisp appearance. The winter scenes are relatively open yet the trees give a sense of enclosure. While the full-leaf summer and fall color scenes are more cluttered, their lush and intense color makes them desirable. The leafless condition of the spring scenes causes them to be more cluttered and colorless; therefore least desirable.

The concurrent ratings of all the seasonal scenes was made on a sunny mid-March day. In this evaluation the summer scenes are given a significantly higher mean scenic value, followed by the fall and winter scenes which are not significantly different. This shift in evaluation is similar to that

TABLE 3. Mean seasonal scenic values from in-season and concurrent evaluations.

Seasonal character	In-season mean	Scheffé test	Concurrent mean	Scheffé test
Full-leaf summer	6.28	**	7.21	**
Fall color	6.05	**	6.39	**
Snow covered winter	6.60	**	6.61	**
Leafless spring	5.66	**	5.11	**

*Note.* The Scheffé test provides a conservative indication that mean scenic values with an \*\* in the same column are not significantly different from each other at  $\alpha = .05$ .

found by Buhyoff and Wellman (1979):

If the photographs in a given test include scenes taken in different seasons of the year, expressed preferences may be biased toward one or another season, depending on the time of year in which the test is made.

It is possible that the seasonality effect can be explained in terms of a novelty mechanism. People tired of winter are aroused by stimuli associated with the impending spring, . . .

It is clear that there are significant differences in the seasonal scenic value of scenes. However, it appears that viewer ratings are also affected by the season during which they make their evaluation as well.

**Evaluators.** There are also significant differences in the overall mean ratings for all scenes. Researchers normally focus on differences among groups of evaluators and rarely evaluate individual differences, probably because they typically are not explained by any simple patterns. One possible explanation for individual differences is that the evaluators used the 10-point rating scale quite differently. An investigation of the responses summarized in Table 4 shows that the mean of the evaluators' ratings was 6.24 with a standard deviation of 1.69, while the mean for each evaluator's ratings ranged from 4.90 to 7.74 with standard deviations between 0.96 and 2.28. Overall, the ratings are skewed toward the high value end of the scale. The measure of kurtosis is moderately flatter, or more even than a normal distribution. One individual had a very peaked distribution (kurtosis = 2.13), the result of concentrating over 90 percent of his ratings between 6 and 8. Each of the 27 evaluators assigned 112 ratings. Fifteen or 55 percent did not use the lowest rating, 41 percent did not use a rating of 2, 15 percent did not use 3, and 4 percent did not use 4 or 5. On the high end of the scale, a third failed to give a rating of 10 and 7 percent did not use the rating 9. These variations

TABLE 4. Summary of individual evaluator's ratings.

Characteristic	Individuals		
	Mean	Minimum	Maximum
Mean rating	6.24	4.90	7.74
Standard deviation	1.69	0.96	2.28
Skewness	-0.21	-0.90	0.63
Kurtosis	-0.22	-0.99	2.13

from the normal are generally not considered cause for concern in data analysis (Nunnally 1978; Sokal & Rohlf 1969).

It is possible to adjust the ratings of individuals to control for the different ways they use the rating scale (Daniel & Boster 1976). When an individual's 112 seasonal ratings are standardized they have a mean of 0.0 and a standard deviation of 1.0. If the analysis of variance model is recalculated, the variation attributable to the evaluators is controlled and the effects of plot and evaluation replication are insignificant. However, variation due to season ( $F = 162.7$ ,  $df = 3, 754$ ,  $p = .0001$ ) and time since harvest ( $F = 38.9$ ,  $df = 6, 751$ ,  $p = .0001$ ) remain significant. This result indicates that there are real differences among the scenic value attributed by each evaluator to these scenes.

#### Season and time since harvest interactions.

While both season and time since harvest have a significant effect upon scenic value, the analysis of variance indicates that they also have a significant interactive effect. Figure 2 shows the mean scenic value of time since harvest for each season as calculated from the in-season evaluations. The general pattern summarized by the cubic curve in Figure 1 is also evident to varying degrees in these seasonal graphs: a low initial scenic value, rising in years after harvest, and then dropping off as revegetation obscures the view. This pattern is particularly evident in the fall and spring and is accentuated by the greater variation in scenic value

over time. The summer and winter have less variation in mean scenic value. Their correspondingly flatter patterns may result from the concealment of slash by herbaceous vegetation in the summer and snow in the winter.

### Conclusions

The northern hardwood forest is a complex and varied environment that offers foresters an exciting management challenge, particularly when its structure is uneven aged. Previous research has indicated that the relation of scenic quality to harvesting in northern hardwood forests is also more complex than had been previously found in western coniferous forests. The results of this study clearly indicate that there is a cycle of change in scenic value after a woodlot is harvested.

**Research implications.** This study has several findings that reflect on the future conduct of forest aesthetics research.

1. The scenic value of a site may vary throughout the year. Researchers tend to investigate full-leaf summer scenes. In many, perhaps most, circumstances sites will be seen year round and viewers will be interested in the year round scenic value. If applied aesthetics research is to become more responsive to the forest as seen year around, then seasonal scenes must be represented.
2. When people evaluate scenic quality, they do so within their present seasonal context. Researchers tend not to consider the time of year they ask individuals to evaluate scenes, nor the interactive effects between the season of the evaluation and the season of the scene. It should become standard practice that scenes are evaluated during the season in which they were taken. If this is not possible, then the season of both the scenes and evaluations should be reported.
3. Researchers tend to investigate differences in the mean evaluations made by groups. This report reminds us that there may also be significant variation among individuals within a group. If this variation is large enough, the researcher should evaluate whether there is more than one group, or whether there is any meaningful group.

**Management implications.** If foresters are seriously interested in obtaining timber from and managing small woodlots, then they must address the aesthetic sensitivities of the owners. It will be a

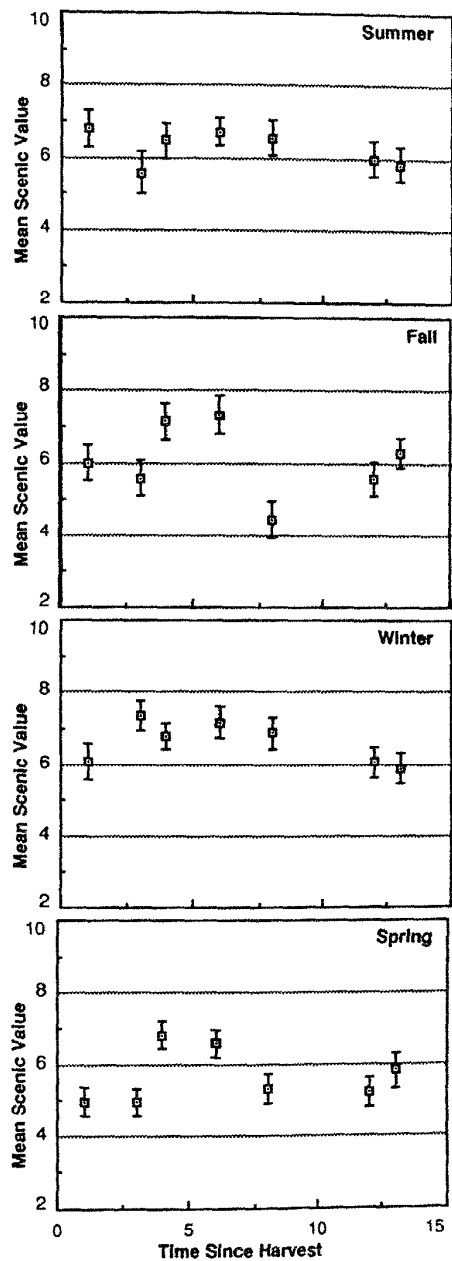


Figure 2. Seasonal mean scenic values with 95 percent confidence intervals for scenes of the same season.

significant task to communicate the potential benefits of forest management to these cautious clients. However, the results of this and other research suggest that timber harvesting need not devastate scenic quality (Brush 1979; Hamilton 1973; McGee 1970; and Rutherford & Shafer 1969). Quite the contrary, an opportunity exists for scenic quality to be enhanced through appropriate management. At a minimum, timber harvesting practices can be adjusted to mitigate negative visual effects.

The usefulness of color photography to record seasonal forest scenes has been demonstrated by this and other research. It now seems appropriate that this technique be transferred into practice as a communication tool for foresters. For instance, a photo series illustrating various management activities over time could be produced to help landowners visualize the effects to their woodlot. Each series could include seasonal scenes and a range of times after the activity. In addition, each scene could be accompanied with perceptual data such as reported here, and environmental data useful for forest management. A similar technique has proven effective in the evaluation of forest residues in the West (Maxwell, W.G. and F.R. Ward 1980).

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# FACTORS INFLUENCING POSTING OF PRIVATE NONINDUSTRIAL FORESTS IN THE NORTHEAST

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This study analyzes the relationships between posting, and both, forest and ownership characteristics for 258 privately owned parcels in Vermont. The results suggest that, although much private forest is not currently posted, concern is warranted. Increases in forest fragmentation, residential construction, education levels and age of owners, and the percentage of professional landowners all point to additional posting of private lands.

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## Introduction

Recent trends in population, age structure, time available for leisure, and discretionary income indicate that the demand for outdoor recreation will continue to rise (USDA For. Serv. 1989). However, a steady decrease in the acreage of private lands open to the public has accompanied these trends. Unless this can be reversed, the availability and quality of outdoor recreational opportunities may deteriorate, particularly in the East.

Statistics on the per-capita availability of public land suggest that there is a great disparity in the availability of many kinds of outdoor recreation opportunities between eastern and western United States. The East supports approximately 80 percent of the nation's population but contains only 5 percent of federal recreation lands (USDA For. Serv. 1989). Even with the addition of state and other public lands, the disparity remains. Current demands are stretching the capacity of some public lands.

Use of the East's abundant private lands for outdoor recreation could ease this disparity. However, the portion of nonindustrial private land open for public recreation decreased from 29 percent in 1977 to less than 20 percent in 1986 (USDA For. Serv. 1989). Fears of property damage, liability, and loss of privacy are among the reasons given for posting to limit public access. Forest industry is also placing more control, and in some cases limits, on public access to lands that have been traditionally open for recreational use.

This study identified characteristics that influence whether forest land will be posted or not. Insight is

provided by analyzing an empirical model that examines the relationship between posting and variables that measure characteristics of the land, owner, and surrounding community. The results are useful for assessing the implications of forest fragmentation and changes in the characteristics of the land-holding population on posting.

## Data and Methods

Forest and ownership data were collected by the USDA Forest Service in its periodic survey of Vermont (Widmann and Birch 1988; Frieswyk and Malley 1985). Information on posting and landowner characteristics were obtained from a questionnaire sent to the owner of each plot sampled in the statewide forest inventory. Plots owned by organizations or businesses were excluded so that the effect of individual owner characteristics, such as education, could be analyzed. This left 258 observations of individually owned nonindustrial private ownerships in Vermont.

A binary choice model (probit) was used to analyze the owner's decision about posting. Judge et al. (1982) and Aldrich and Nelson (1984) provide detailed discussions of probit models. The model can be used to estimate the probability that land with a given set of characteristics will be posted and to estimate how changes in the selected explanatory variables will influence that probability.

## Results

Table 1 provides definitions for each variable, Table 2 shows the regression results, and Table 3 shows the marginal responses and elasticities evaluated at the mean values for the explanatory variables.

It appears that additional posting will accompany fragmentation of the forest into smaller parcels. A negative relationship was obtained between the probability of posting and the natural logarithm of size of ownership. All else equal, larger parcels were less likely to be posted. However, it is important to remember that these analyses did not include forest industry. There has been a large increase in the amount of industrial lands that are closed to the public (USDA For. Serv. 1989). A preliminary regression of data that included industrial holdings supported that conclusion by yielding a positive correlation between industrial ownership and posting.

Public access may be further decreased as more residences are built in rural forested areas. Shorter distances between the owner's home and the forested parcel were correlated with an increased probability of posting. Perhaps concerns over privacy and personal safety motivate many landowners to post their land.

Table 1. Definition of Variables

Variable	Definition
POST	Dependent variable, coded 1 if landowner posts land and 0 otherwise
Log (SIZE)	Natural logarithm of the number of wooded acres owned
ED	Years of formal education
AGE	Age of landowner (years)
DIST	Distance from owner's residence to nearest portion of forestland (miles)
PRO	Variable, coded 1 if owner is employed in a white collar or professional occupation and 0, otherwise

Table 2. Probit Results

Explanatory variable	Coefficient	Standard error	Mean of variable	
			Did post	Did not post
Constant	-2.3971***	0.6805	--	--
Log (SIZE)	-0.1466**	0.0684	4.67	5.03
ED	0.0791***	0.0295	15.61	14.12
AGE	0.0201	0.0081	58.03	56.29
DIST	-0.0013*	0.0074	39.08	99.58
PRO	0.3244	0.2036	0.52	0.38

N = 258

LIKELIHOOD RATIO STATISTIC = 23.24

\*\*\*Significant at 2-percent level

\*\*Significant at 5-percent level

\*Significant at 10-percent level

Several landowner characteristics also appear to influence posting. Both the landowner's age and education level were strongly correlated with posting. Each correlation was positive and statistically significant at the 2-percent level. A positive but weaker ( $p=11\%$ ) was found between the probability that the parcel was posted and the owner's employment in a white collar or professional position.

Trends in these variables may have a significant effect on the future availability of private lands for recreation. The percentage of older landowners is expected to increase as the baby boom generation ages. Education levels are also increasing. Approximately two-thirds of Vermont's individually owned forest land is held by owners who have attended college and almost one-third is held by owners who are employed in professional or white collar occupations (Widmann and Birch 1988).

Other variables were examined but were not statistically correlated with posting. Land characteristics, such as timber volume, species composition, or proximity to a maintained road did not appear to effect the probability of posting. Similarly, no correlation was found between posting and many landowner characteristics, such as tenure of ownership, retirement status, or whether the owner was brought up on a farm or in a large city.

The estimated probability that a parcel was posted was 0.21, evaluated at the mean values of the explanatory variables. The marginal responses and elasticities, also evaluated at the sample means, are shown in Table 3. Elasticities measure the percentage change in the probability that a parcel is posted resulting from a 1-percent increase in an explanatory variable. Estimated elasticities of approximately 1.6 indicate that changes in the ages or education levels of landowners are likely to have a greater effect on posting than equivalent percentage changes in the other explanatory variables.

## Conclusion

Increasing population and participation rates are stretching the capacity of some public recreation lands. Overuse can detract from the quality of the recreational experience for all users and may cause long-term site damage. This is particularly troublesome in the highly populated East, which has a lower per-capita availability of public land than does the West. Private lands may be the key to meeting future demands for some types of outdoor recreation.

Landowner surveys (e.g. Widmann and Birch 1988) and the empirical results of this study (estimated probability of posting equals 0.21) indicate that much individually owned private land is not currently posted. However, recent increases in posting of industrial ownerships and the estimated effects of a continuation in trends for the explanatory variables used in this study suggest that concern is warranted.

Increased fragmentation of the forest, residential construction, education levels and age of owners, and the percentage of white collar landowners, all point to additional posting of private lands. Programs that provide relief from property taxes for parcels that are open to the public may be effective in reversing the effect of these trends. Legislation that protects owners from liability suits may also discourage additional posting. The effectiveness of these programs will, to a large extent, depend on the respect that users show to the land and owners. Educational programs may be crucial in developing this respect.

Table 3. Marginal Responses and Elasticities Evaluated at the Mean

Variable X	Marginal Response	Elasticity
LOG (SIZE)	-0.0419	-1.000
ED	0.0226	1.579
AGE	0.0057	1.573
DIST	-0.0004	-0.156
PRO	0.0928	0.186

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PASSIVE TRAIL MANAGEMENT  
IN NORTHEASTERN ALPINE ZONES:  
A CASE STUDY

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Scree walls were constructed in 1977 to minimize hiker impact of alpine vegetation on Franconia Ridge, NH. The scree walls were effective in protecting alpine habitat from hiker trampling and in permitting natural revegetation. Haircap moss (*Polytricum juniperinum* var. *alpestre*) and mountain sandwort (*Minuartia groenlandica*) dominated revegetation of the disturbed areas. Scree walls create a protective microhabitat for alpine vegetation. Questionnaire results showed 87% of the hikers felt the scree walls effective and 80% felt them unobtrusive. Well maintained rock cairns, paint marks and educational signs complement the scree walls. The removal of rocks for scree wall construction must be done selectively. Scree walls offer excellent long term passive trail management with minimal annual cost.

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Introduction

Recreational hiking and backpacking in the mountains and alpine areas of New York, Vermont, New Hampshire and Maine increased dramatically in the early 1970's. One mountain range in particular that received significant use during this time was the Franconia Ridge in the White Mountain National Forest, New Hampshire. Counts of 400 plus people were documented hiking the

section of Appalachian Trail that traverses the ridge, on a single weekend day (Snyder, 1974). This use level has continued with minor fluctuations to date (Waterman pers. comm., 1989).

Prior to 1977, the trail located in the alpine zone of Franconia Ridge, had a poorly defined treadway. The many hikers and backpackers using the ridge trail generally did not follow a single path and tended to wander "off trail". This hiking pattern resulted in trampled alpine vegetation and extensive soil erosion. Several sections of multiple parallel trails developed 10 to 15 meters in width (Snyder, 1974).

In response to this impact, the USDA Forest Service and Appalachian Mountain Club Trail Crew constructed low rock walls (scree walls) bordering both sides of the entire ridge trail. The objective of this technique was to define the width and direction of the trail in order to prevent additional hiker impact and to promote revegetation in the heavily disturbed areas. Twelve years after construction, we studied the efficacy of the scree wall technique for protecting alpine habitat adjacent to the ridge trail.

The objective of this study was to quantify the effectiveness of scree walls in protecting and revegetating alpine habitat damaged by hiker trampling in the eastern United States. The study compares the vegetative cover of disturbed alpine habitat between the pre-scree wall condition in 1975 and the condition 12 yrs after scree wall construction, in 1989. Incorporated in the study was a hiker questionnaire developed to learn user opinions of scree wall effectiveness and degree of aesthetic obtrusion. Individuals that constructed and maintained the scree wall were interviewed for pertinent management information.

Description of Study Location

The trail and adjacent area under study was 2.7 km in length and ran along the spine of the steep sided, generally north - south

oriented Franconia Ridge, White Mountain National Forest, New Hampshire.

Located exclusively in the alpine zone, the ridge trail rises over the summits of Mt. Lafayette (1605 m), Mt. Lincoln (1553 m) and Little Haystack Mountain (1376 m). The ridge has many rock outcrops and a mixture of flat and sloped terrain. The ridge trail is part of a 13 km loop (approximately 6 - 8 hr hike) that is easily accessed by either the Old Bridle Path or Falling Waters trails. The trailhead for this hiking loop is located on Interstate 93 in Franconia Notch State Park.

The climate is characterized as subarctic; including high winds, low temperatures, frequent ground level clouds, heavy icing and dramatic weather changes. The most common vegetative community type of the Franconia Ridge alpine zone is the dwarf shrub heath-rush association, dominated by *Juncus trifidus*, *Potentilla tridentata*, *Vaccinium vitis-idaea*, and *V. uliginosum* (Marchand and Roach, 1980). Other common species are *Carex Bigelowii*, *Arenaria groenlandica*, and *Diapensia lapponica*. The latter two species along with a moss, *Polytricum juniperinum* var. *alpestre*, were frequently found on bare mineral soils. Various species of lichen within the genus *Cetraria*, were found in both barren and vegetated areas.

The narrow band of alpine vegetation along the Franconia Ridge is probably an artifact of strong winds that blow the protective snow cover from the ridge crest. Combined with mechanical ice damage, tree growth is inhibited, allowing for colonization by an alpine plant community.

## Methods

### Vegetation Transects

In 1975, 31 permanent transects were established with the purpose, in part, to measure the amount of vegetation adjacent to the Franconia Ridge trail before and after scree wall construction. The transects were located perpendicular to the ridge trail at

approximately 25 m intervals from the summit of Mt. Lafayette to the summit of Little Haystack. The length of each transect varied between 6 and 14 meters as determined by the local topography. Each transect crossed a defined gradient of relatively low disturbance, adjacent to the main treadway (section C) through an area of high disturbance, the main treadway (sections A & B) returning to another area of low disturbance (section C) (Fig. 1).

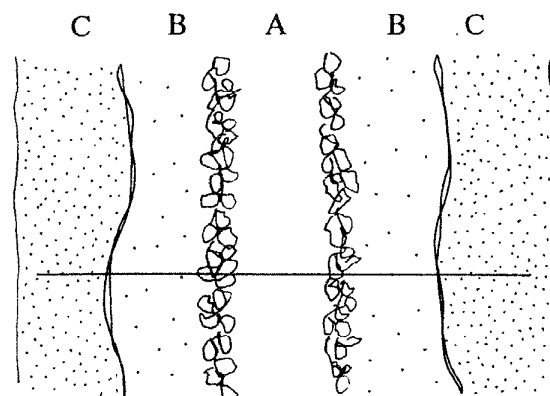


Figure 1. Aerial view illustration of Franconia Ridge Trail segment showing trail treadway with scree walls (section A), high hiker impact area (section B) and low hiker impact area (section C). Horizontal line represents a trail transect.

In 1975, vegetation and soil type cover were measured using the line intercept method for all 31 transects. In 1989, twelve years after scree wall construction, 13 of the 31 transects were relocated and vegetative and soil type cover measurements were repeated similar to the 1975 technique. Although only 13 transects were usable in 1989, they were representative of the different types of disturbed areas.

Quantitative comparisons of vegetative and soil type cover between 1975 and 1989 were based on the different levels of disturbance along each transect. Each transect was divided into three sections for analysis (Fig. 1):

Section A - area of high hiker impact that includes scree walls and present defined trail treadway.

Section B - area adjacent to section A where high hiker impact occurred before scree wall construction, but low hiker impact after scree wall construction.

Section C - outer area most distant from the trail treadway with low hiker impact both before and after scree wall construction.

Sections B and C, each had an east and west side for each transect. No differences in vegetative cover between the east-west gradient was apparent. Therefore, the data collected for both sides were pooled by section for analysis.

Some change in cover measurements from 1975 to 1989 is attributable to sampling error inherent to the line intercept method in a relatively diverse community type. Additional error is caused when measurements are collected by different people at different times. These may constitute a minor portion of the documented change in vegetative cover.

#### Hiker Questionnaire

Franconia Ridge Trail hiker opinions of scree wall effectiveness and its impact on their backcountry experience on Franconia Ridge was measured by a questionnaire. The questionnaire was administered at the AMC Greenleaf Hut located on the shoulder of Mt. Lafayette on a voluntary basis during June through August 1989. Hikers completing the questionnaire, as a prerequisite, must have hiked the Franconia Ridge Trail earlier that particular day. A total of 334 questionnaires were completed.

#### Interviews

We interviewed people involved in the actual design, construction and maintenance of the scree wall. Background information

related to the consideration of management alternatives in controlling trail problems, and what steps and precautions were made to organize and implement scree wall construction was recorded. We addressed positive and negative aspects of the scree wall technique as related to cost effectiveness, user opinion and construction. Information was available relative to the maintenance and follow-up work required after actual construction.

#### Results and Discussion

Alpine vegetation is morphologically and physiologically adapted to survive the extreme climatic conditions of the alpine zone (Daubenmire, 1941; Billings, 1974), in addition to low soil nutrient concentrations, short growing seasons and ground frost heaving. However, alpine vegetation is not well adapted to trampling from great numbers of people (Billings, 1974; Brown et al., 1978).

The extensive disturbance to vegetation along the Franconia Ridge Trail in the early 1970's was due to a high level of hiker use and inadequate trail definition (Rajala pers. comm., 1989). Prior to 1977, existing trail markers, paint and rock cairns, were not promoting a single narrow treadway. Given this situation, the ridge trail was reconstructed.

Scree walls (low rock walls) were chosen as the primary trail marking technique with the objectives of establishing a narrower treadway, stabilizing the ridge trail and permitting alpine revegetation outside of the scree wall. In 1975, two years before scree wall construction, the average width of the ridge trail was  $3.6 \pm 1.2$  (SD) meters. The average width of the ridge trail in 1989 was  $2.1 \pm 0.9$  (SD) meters. This was a significant decrease in trail width of  $1.5 \pm 1.3$  (SD) meters (paired t-test;  $n = 13$ ;  $p = 0.003$ ).

No surveys were conducted to estimate the number of hikers crossing over the scree walls and out of the Franconia Ridge trail treadway during the past twelve years. However, this passive technique contributed

in preventing 90% of hikers from entering the primary habitat of *Potentilla robbinsiana* during the summer 1980, on the Monroe Flats, Mt. Washington (Taylor, 1981).

### Vegetation Recovery

Studies on the recovery of alpine vegetation on sites disturbed by trampling have concluded that natural revegetation is possible, however, it may be a slow process (Willard and Marr, 1970; Roach and Marchand, 1984). Most likely, revegetation in the areas adjacent to the ridge trail occurred over a twelve year period, beginning after the scree wall construction in 1977.

Section A - Trail Treadway. Not surprisingly, the trail treadway was relatively barren both before and after scree wall construction (Table I). Vegetative cover in 1975 was 3% and in 1989, the cover was 2%. The lack of change in vegetative cover is attributed to the concentration of hiker trampling in the treadway both before and after 1977.

Table I. Line intercept cover of vegetation (cm) for transect section A (treadway) with high hiker impact before and after 1977 for transects surveyed in 1975 and 1989.

Transect	Linear Distance of A in 1975 & 1989	Cover of Vegetation 1975 (cm) 1989		Change (+ or -)
T1A	180 cm	.	5	+ 5
T2A	210 cm	20	20	0
T3A	285 cm	5	25	+ 20
T4A	205 cm	5	.	- 5
T6A	175 cm	.	.	0
T14A	275 cm	.	.	0
T21A	45 cm	.	.	0
T22A	.	.	.	.
T24A	410 cm	.	.	0
T26A	225 cm	.	.	0
T28A	175 cm	30	.	- 30
T29A	.	.	.	.
T30A	180 cm	.	5	+ 5

### Section B - Previously disturbed area.

Following protection, natural revegetation occurred on areas disturbed by trampling (Table II). The heavily disturbed area adjacent to the scree wall, section B, increased from a relatively barren condition of 6% vegetative cover in 1975 to 26% in 1989. Based on the Wilcoxon paired rank test, the vegetative cover for section B in 1989 was significantly greater than in 1975 ( $n=10$ ;  $p=0.007$ ). This degree of revegetation indicates that hiker impact in the area adjacent to the ridge trail has significantly decreased and that eastern alpine vegetation has the ability to naturally recover disturbed sites.

Table II. Line intercept cover of vegetation (cm) for transect section B with high hiker impact before 1977 and low hiker impact after 1977 for transects surveyed in 1975 and 1989.

Transect	Linear Distance of B in 1975 & 1989	Cover of Vegetation 1975 (cm) 1989		Change (+ or -)
T1B	165 cm	20	80	+ 60
T2B	155 cm	10	95	+ 85
T3B	55 cm	5	5	0
T4B	285 cm	40	110	+ 70
T6B	380 cm	50	105	+ 55
T14B	.	.	.	.
T21B	850 cm	.	35	+ 35
T22B	375 cm	.	125	+ 125
T24B	40 cm	.	.	.
T26B	105 cm	.	45	+ 45
T28B	50 cm	30	.	- 30
T29B	250 cm	.	90	+ 90
T30B	330 cm	20	85	+ 65

Section C - Undisturbed area. Alpine plants have existed almost as long as plants and mountains have been together (Billings, 1974). Undisturbed alpine plant communities are relatively stable as documented in the alpine meadow on Mt. Marcy, NY over a 24 year period (Ketchledge and Leonard, 1984). Because section C received minimal disturbance before and after scree wall construction, insignificant changes in vegetative cover was expected. However,

vegetative cover increased from 21% in 1975 to 38% in 1989. Based on the Wilcoxon paired rank test, the vegetative cover for section C in 1989 was significantly greater than in 1975 ( $n = 13$ ;  $p = 0.005$ ) (Table III).

Table III. Line intercept cover of vegetation (cm) for transect section C with low hiker impact before and after 1975 for transects surveyed in 1975 and 1989.

Transect	Linear Distance of C in 1975 & 1989	Cover of Vegetation 1975 (cm) 1989		Change (+ or -)
T1C	280 cm	35	95	+ 60
T2C	275 cm	105	130	+ 25
T3C	1220 cm	210	439	+229
T4C	170 cm	40	30	- 30
T6C	730 cm	120	160	+ 40
T14C	725 cm	85	365	+280
T21C	298 cm	20	40	+ 20
T22C	380 cm	40	85	+ 45
T24C	360 cm	100	105	+ 5
T26C	340 cm	140	120	- 20
T28C	230 cm	140	180	+ 40
T29C	410 cm	105	275	+170
T30C	140 cm	10	75	+ 65

Not all alpine plant species are adapted to revegetate disturbed areas. Disturbances provide entirely new environmental conditions to which many natives are not adapted (Brown et al., 1978). Revegetation occurred in transect sections B and C. The two species dominating these areas of revegetation were haircap moss (*Polytricum juniperinum* var. *alpestre*) and mountain sandwort (*Arenaria groenlandica*).

Mountain sandwort is considered a pioneering species on disturbed sites (Roach and Marchand, 1984) with optimum reproductive potential. Haircap moss had the greatest cover of the species recolonizing the disturbed sites. Marchand and Roach (1980) also found bryophytes commonly recolonizing abandoned trail sites in the alpine zone. These same two species dominated the increase in vegetative cover of section C, where hiker trampling was minimal. The barren ground in section C was created by

the removal of rock material for the scree wall. Hiker trampling was not the cause of disturbance in this section.

The pattern of revegetation is not uniform. The reasons for these spatial differences in recovery are the varying physical factors of topographic exposure and distribution of snow and meltwater, superimposed upon microhabitat (Billings and Mooney, 1968). Additional factors are the sexual and vegetative reproductive success of the recolonizing species and the proximity of populations able to act as seed sources. For example, revegetation occurred immediately outside and within the rock walls as a result of the protection from physical damage such as icing and high winds. The accumulated snow on the lee and to some extent the windward sides of the wall, acts as a protective cover for the vegetation. In effect, a microclimate was created with the scree wall construction, that benefits the recovery of alpine vegetation.

Soil compaction from hikers is probably not a serious long-term problem in eastern alpine habitat. Frequent freeze thaw cycles combined with wind removal of snow pack is a common occurrence (Roach and Marchand, 1984). Consequently, the soils are often disturbed and vertically uplifted due to natural physical processes. Soil movement may pose a threat to the establishment of colonizing plant species.

In summary, 20% of the area void of vegetation in transect section B and 17% of the area freed of rock in section C revegetated through natural processes within a 12 yr period. The revegetation was dominated by colonizing species, and at this time it is unclear as to how long and to what extent later successional species will become established.

#### Hiker Questionnaire

The objective of the questionnaire was to learn opinions of scree wall effectiveness

and degree of visual obtrusion along the ridge trail. Additionally, we collected information relative to the type, age and experience of the Franconia Ridge Trail hiker in 1989. In summary, the typical hiker on the ridge trail was 30 - 39 yrs of age, on a day hike and hiking the trail for the first time.

Although scree walls remain the first step in controlling traffic in the alpine zone, hikers were still leaving the ridge trail at particular locations (Waterman and Waterman, 1989). Rock cairns, paint marks and educational signs were constructed to complement the scree walls and to help alleviate the problems where the trail became unclear. When asked what the most obvious method used to define the ridge trail was, 47% of the hikers chose rock cairns. Paint marks were chosen by 24%, trail treadway by 20% and scree wall by 19%. The remaining methods were chosen by less than 3%. Rock cairns, paint marks and the treadway are more obvious than the scree walls. When asked if the methods were effective, 87% of the hikers said "yes" and 81% of the hikers felt the methods unobtrusive.

The three techniques criticized the most were paint marks, rock cairns and scree walls. Generally, hikers felt they had positive and negative attributes. The paint marks were "easily seen, but least attractive". The rock cairns were "effective and positive in bad weather", however, "people zig-zag in between them". Scree walls were "like a backyard sidewalk", however, "positive for keeping on trail". Some hikers felt the "trail obvious when you see vegetation".

### Management Summary

The reconstruction of the Franconia Ridge Trail was an innovative step towards reaching a balance between controlling hiker disturbance and preserving the backcountry experience in the alpine zone.

When the scree walls were constructed in 1977, a small percentage of the public vociferously objected to the walls' visual obtrusion on the beauty of Franconia Ridge.

Trail managers had anticipated the "new look" of the ridge trail and considered the public outcry a reason to possibly forgo scree wall construction. However, the damage to alpine flora was great and the current trail markers were not sufficient.

The reconstruction of the Franconia Ridge Trail was a major operation. Multiple trail crews worked over an 8 - 10 wk period for a total cost of \$18,250.00 in 1977. The tally for work done was as follows: 9,600 ft of scree wall; 650 rock steps; 141 ft of water bars; 32 ft of ditches; and 15 step stones. Enough on-site materials in fairly accessible areas existed on Franconia Ridge to abandon expensive airlifting from another location.

### Conclusions and Recommendations

We found 18% natural revegetation over 12 years in protected alpine habitats previously disturbed by trampling on Franconia Ridge. After 12 yrs, the revegetation is still dominated by early colonizing species such as haircap moss and mountain sandwort. Scree walls create microhabitats that favor establishment and survival of alpine plants.

Disturbance is inherent when searching for and collecting rock materials for trail work of this magnitude in the alpine zone. A plant and animal species inventory of the area before trail reconstruction is necessary to avoid disturbing rare and/or endangered species. The removal of rocks for scree wall construction must be done selectively. Where rocks provide physical cover for plants, they should not be removed. Rocks exposed in thick mats of vegetation can be removed with less impact to surrounding plant communities.

Incorporate the various scenic rock outcrops and vistas into the trail route, while keeping the challenge in the trail and traffic on solid ground, preferably bedrock. Limit the width of trail and size and placement of the scree walls based on the potential for hiker disturbance to the local area. Maintain the scree wall and trail markers on a regular basis.

Scree walls are effective, particularly when combined with rock cairns, paint marks and educational signs, in keeping hikers within a defined trail treadway. Over time, hikers generally accept scree walls as part of their backcountry experience. Education and information via displays, signs and/or personnel in the backcountry, encourages hikers to stay on the trail in the alpine zone. Scree walls can be expensive to construct, but offer excellent long term passive management with minimal annual cost.

### Acknowledgements

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## ATTITUDES AND RESOURCE USE: A STUDY OF NORTH COUNTRY CITIZENS

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### Abstract

This paper reports on an analysis of attitudes and patterns of resource use of residents of Vermont and New Hampshire's northern counties. Solid waste disposal, population growth and the preservation of agricultural land, and the impacts of development upon lakeshores, wildlife, and rivers and streams were identified as the most serious community problems. This information is then used, along with sociodemographic data, in a multivariate analysis of differences in outdoor recreation use.

### Introduction

New Hampshire and Vermont's northernmost counties are heavily reliant on natural resources for their economic base. Here, large land holders, represented by companies headquartered outside the region, have practiced consistent land use patterns, primarily timber extraction. For many decades the relationship between these landowners and the citizens of this region has remained relatively stable. Recently, however, we have seen the beginnings of a drastic change in ownership of these land holdings. For residents, this shift portends a change in traditional access to land-based economic and recreational opportunities.

As a result, the United States government has initiated a study of how best to protect the forest resource of the region. The U.S. Congress authorized \$250,000 for this effort, a sum which was to be matched by the four state governments (Harper, 1989). The study's focus was to identify "alternative strategies to protect the long-term integrity and traditional uses of the lands".

However, the identification of strategies to protect land uses also involves the need to focus on the human dimensions of land management policies. Residents of the area may suffer diminished employment opportunities, environmental quality, and recreational access as a result of changes in land ownership or land use.

To understand better the potential human impacts of changes in land ownership and land use in the region, a random telephone survey of Vermont and New Hampshire North Country residents was conducted. The purpose of our study is to report on the attitudes and patterns of resource use of area residents -- their perceptions of community problems, frequency of participation in a variety of outdoor activities, and attitudes toward local and regional planning.

### Site Description

By almost any definition, northern Vermont and New Hampshire have a significant, if not dominant, rural character. Lying well beyond the influence of several large metropolitan areas -- Boston, Massachusetts; Portland, Maine; and Montreal, Quebec, Canada -- the region contains some of the most sparsely settled land in New England. Because of its location, demographics, and reliance on land-based resources for both recreational and economic opportunities, this area is well suited to examine how a large scale restructuring of land ownerships may impact local residents.

As of July 1, 1986, the total population of this two-state region was 109,600, which represented an increase of about 2% from the 1980 census population of 107,475. Coos County in New Hampshire actually experienced a net loss of 3.2% during that time, while Lamoille County, Vermont, had the largest population gain, 7.9%. Within the 5 counties selected for the study, there are 114 minor civil divisions. The 1986 populations of these units ranged from a low of 50 in Victory, Vermont, to a high of 12,200 in Berlin, New Hampshire. In 1986, the average population size for communities in this five county area was 961 persons, and only 12 communities had populations exceeding 2,500.

Moreover, these counties are characterized by low per capita income averages. All reported smaller increases in per capita income for the period 1979 to 1985 than did their states, and only Lamoille County, Vermont, was within 10% of the state average. That this region failed to enjoy the kind of economic and demographic expansion experienced by the balance of New Hampshire and Vermont further supports the need for attention to the human impact of a major restructuring of resource allocation within the area.

Its natural resources afford abundant, year-round recreational opportunities. A major section of the White Mountain National Forest, several large state-owned forests, the highest peaks in both states (Mt. Washington, New Hampshire and Mt. Mansfield, Vermont), and the headwaters of many of the states' major rivers including the Black, the Connecticut, the Winooski, and the Lamoille all lie within the boundaries of the study area. The region's spectacular scenery bespeaks the image of quintessential Northern New England.

Residents of the area have enjoyed virtually unlimited access to the vast tracts of forest land owned by paper and logging corporations. The road network supplied by these owners provides egress for a variety of outdoor recreational activities. The importance of these activities cannot be over-emphasized in light of the sparsely populated, rural character of the region.



These recreational amenities have begun to attract increased numbers of vacationers and retirees from the large metropolitan areas within several hours commute. Numerous seasonal camps and settlements have undergone a protracted period of expansion and conversion to year-round homes. The area is increasingly becoming a location for time-sharing condominiums (Kacpzyński, 1989). As a result of these activities, real estate values are rising, especially for land with river, pond, and/or lake frontage.

Within the prevailing economic climate, timber holding companies are reevaluating their long-term land holding strategies. In an economy driven by short-term efforts to maximize return on investment, the traditional, long-term view associated with forest land holdings is no longer the norm. Instead, the short-term real estate value of the land supercedes its natural resource value. Diamond Occidental Forest land sales of more than 400,000 acres in 1988 in the Northern Forest Lands area confirmed the fears of timber industry observers.

### Study Design

With the potential for change to large land-ownership, land utilization, and people-to-land relationship changes in the contiguous lands of northern Vermont and New Hampshire, increased impacts of growth and development proximate to one of New England's major recreational areas may occur. In order to assess these impacts, a survey of the indigenous population of the area was undertaken. Using a modified "Total Design" methodology (Dillman, 1978), a telephone survey was designed. Residents of Coos County (New Hampshire) and of Caledonia, Essex, Lamoille, and Orleans counties (Vermont), all part of the larger Northern Lands Study area site, were chosen in proportion to the size of the population of their town. In New Hampshire, 175 interviews were completed and in Vermont 271 interviews were completed.

Surveys were conducted in both states over a six-day period with randomly generated calls, so designed to include both weekdays and weekends. Surprisingly few (less than 3%) refusals were encountered. The margin of error associated with a sample of this size is  $\pm 5\%$ , assuming 95% confidence intervals and 5% allowable error. In theory, 95 times out of 100 combined sample results should differ by no more than 5 percentage points from what would have been found by surveying the entire population in the northern counties. This sampling error may be larger for smaller subgroups in the survey.

The survey specifically asked individuals to identify the most important issues facing their communities; the frequency of their participation in a variety of recreational activities; and their attitudes towards growth and development in their community and in their surrounding communities, among other things. Demographic questions were included to establish sample characteristics.

### Survey Results -- Vermont and New Hampshire

The purpose of this part of the study is to report opinions of North Country Vermont and New Hampshire residents regarding community problems,

participation in outdoor recreation activities, and local planning efforts in the northern tier of the two-state region. Several types of statistical tests were selected to analyze study data. The chi-square statistic was used to test nominal data and the t-test was applied to Vermont versus New Hampshire scale data. Since a one-way analysis of variance (ANOVA) extends the applicability of the t-test to more than two categories, it was employed to analyze disparities between size of community (population) and the scaled data.

### Respondent Characteristics

Table 1 shows some selected demographic characteristics of the New Hampshire and Vermont residents participating in the survey. In general, the two samples differed very little with respect to demographic characteristics. Only with respect to the level of educational attainment did the Vermont and New Hampshire samples differ significantly ( $p=.04$ ). Approximately the same percentage of New Hampshire and Vermont respondents reported being high school graduates: 44.0% and 42.8%, respectively. More New Hampshire respondents reported having some college or vocational/technical training than did Vermont respondents (21.1% and 18.8%, respectively). However, New Hampshire respondents included a higher percentage of people with less than a high school degree (20.0%) than Vermont respondents (13.2%). Finally, more Vermonters (25.1%) reported having completed college and/or some post graduate work than did New Hampshire respondents (22.3%).

Table 1. Summary Demographic Characteristics

	New Hampshire	Vermont
Gender - % Female	62%	66%
Average Age	41 yrs	42 yrs
Marital Status -		
% Married	74%	69%
Education -		
% High School Graduates	44%	43%
% College/Post College	22%	25%
Employment -		
% Full or Part Time	54%	61%
Income -		
% \$30,000 or more	43%	35%
Avg. Length State Residency	32 yrs	32 yrs
Avg. Length Community Residency	24 yrs	20 yrs

Demographic and economic characteristics of this sample were typical of what we might expect of North Country communities. More women than men responded to the phone survey. Just over 2 in 5 respondents were over age 50, 1 in 5 were over 30 and an additional 49% were middle aged, 30 to 50. Two in 3 respondents were from two-adult households and about

1 in 5 were from single person households. At 5.6%, unemployment was double the state rates for the period. An additional 58% worked full or part time, almost 1 in 4 were retired and the balance were homemakers or students. Household incomes for the area were relatively balanced, with one-third of those responding earning between \$15,000 and \$30,000 annually. An additional 38% exceeded incomes of \$30,000 and about 1 in 4 reported incomes below \$15,000. The majority (70%) of the respondents were married. Length of state residence showed a wide distribution, with 1 in 4 reporting residence in excess of 50 years, 1 in 5 with less than 10 years residence, and the balance distributed between these poles. Half reported native or near-native status, with 1 in 5 having spent less than 25% of their lives in New Hampshire or Vermont. These characteristics are used to help explain reported attitudes and perceptions below.

### Community Problems

Survey participants were asked to rate the seriousness of a variety of community problems, such as solid waste disposal, population growth, the preservation of forested lands, and other issues. As shown in Table 2, respondents from both states indicated that getting rid of solid waste presented a serious problem. Access to forest lands, maintenance of an industrial wood supply, and opportunities to participate in outdoor recreation activities received scores which indicated that survey respondents did not consider the loss of these to be serious problems within their communities.

Table 2. Seriousness of Community Problems by State

COMMUNITY PROBLEM **	NEW HAMPSHIRE		VERMONT	
	Mean	Std Dev	Mean	Std Dev
Rid Solid Waste	2.33	.89	2.21	.92
Preservation of Forested Land	2.56	.80	2.50	.81
Dev Impacts - Wildlife	2.61	.75	2.51	.77
Preservation of Agr Land	2.63	.80	* 2.38	.84
Dev Impacts - Rivers/Streams	2.67	.74	2.54	.80
Dev Adequate Sewer & Water Services	2.69	.68	2.72	.68
Population Growth	2.74	.61	2.66	.59
Maintaining Ind Wood Supply	2.79	.79	* 2.96	.74
Oppor Participate in Outdoor Rec	2.81	.55	* 2.91	.39
Dev Impacts - Lakeshores	2.83	.79	* 2.59	.86
Access to Forest Lands - Your Area	2.94	.49	2.97	.49

\*Represents a significant difference between New Hampshire and Vermont respondents at the .05 level

\*\*Respondents rated the seriousness of community problems as follows: 1 = Very Serious; 2 = Serious; 3 = Not a Problem

Respondents from the two states differed significantly in assigning the level of seriousness to several of the problems. Vermont respondents were more concerned about preservation of agricultural land ( $t=3.15$ ,  $p=.00$ ) and impacts of development on lakeshores ( $t=3.05$ ,  $p=.00$ ). New Hampshire respondents voiced greater concern regarding the maintenance of an industrial wood supply ( $t=2.17$ ,  $p=.03$ ) and opportunities to participate in outdoor recreation ( $t=2.24$ ,  $p=.03$ ), although these problems were rated low in importance. These differences may be explained by the context: agriculture makes a greater direct economic contribution in Vermont than it does in New Hampshire. The dominance of wood industry interests in northern New Hampshire, when contrasted with the more diversified economy in Vermont's Northeast Kingdom, helps to explain the different perceptions of the importance of maintaining an industrial wood supply. Differences in the perceived importance of development impacts on lakeshores and opportunities to participate in outdoor recreation are not as clear, but may reflect the increased developmental activity occurring in Coos County.

Survey participants were asked to select the single most serious problem of those items they had selected as 'very serious.' Overall, solid waste issues captured the attention of North Country citizens, receiving more than twice the number of responses of any other problem. Similarly, expressed concern for population growth and the preservation of agriculture lands followed in a second "tier" of concerns. A third level of concern was expressed for the impacts of development upon lakeshores, wildlife, and rivers and streams. Also included in this third level of problems was development of adequate sewer and water services.

### Outdoor Activities

In the survey, participants were asked to indicate how frequently they participated in various outdoor recreational activities. Walking and driving for pleasure were listed as frequent outdoor activities for respondents from both states. Respondents occasionally participated in fishing, berry picking, hiking, bird watching, gathering firewood, swimming, bicycling, stargazing, and picnicking. The survey showed that relatively few North Country residents participated in all-terrain vehicle use, maple sugaring, and horseback riding. Respondents differed significantly by state for only 1 outdoor recreational activity, canoeing, with New Hampshire residents more likely to engage in it ( $t=-2.05$ ,  $p=.04$ ).

### Local and Regional Planning Preferences

A series of survey questions ascertained respondents' attitudes toward growth and development, their evaluation of community planning efforts within their community as well as in other communities, and their preferences regarding regional planning groups. Almost half of the respondents from both states (49.4%) favored limitations to growth in their communities: 29.4% favored strong limitations and 20.0% moderate ones. On the other hand, almost one-third (32.3%) of the total felt that their communities should encourage development -- 12.8% strongly encourage and 19.5% moderately encourage. The chi-square statistic showed

that North Country respondents from New Hampshire and Vermont differed in their attitudes toward future growth ( $p=.02$ ). The New Hampshire respondents tended to be divided in their attitudes toward growth: almost 32% indicated they felt growth should be limited, while 36% reported that growth should be encouraged. However, more than half of the Vermont respondents indicated that growth should be limited. Less than 30% of the Vermont participants supported the concept of encouraging future growth. About 10% of the Vermonters and 14.0% of the New Hampshire sample reported that growth was not much of a problem.

Local planning can provide a means for promoting or discouraging growth. Without raising specific local planning problems, respondents were asked to evaluate the performance of town planning. Two in 5 respondents, 41%, rated their town planning as "good" to "excellent." Another 30% found the local efforts to be "fair." Community planning was rated as "poor" by 16.1% of the total survey participants, and 13.5% did not have an opinion or declined to answer the question. Thus, 7 in 10 North Country respondents appeared positively inclined to local planning efforts.

The Vermont respondents were relatively more positive about their communities' planning efforts. Using the chi-square statistic, it was found that the attitudes differed significantly by state ( $p=.01$ ). Approximately 10% of the Vermonters surveyed rated their community planning as "excellent," versus 4.0% of the New Hampshire respondents. Community planning efforts were rated "good" by 35.1% of the Vermont respondents compared to 29.7% of the New Hampshire respondents, suggesting greater support for planning in Vermont.

Respondents were then asked to rate the planning efforts of neighboring communities. Their responses showed that they placed such communities' current planning levels below their own. Other communities' planning efforts were rated "excellent" by only 3.6% of the survey participants. About 60% rated those efforts as "good" or "fair," and 14.6% of those surveyed rated the planning efforts "poor." Of the total respondents, 21.5% had no opinion or declined to answer the question. The distribution was not statistically different by state.

Study participants were also asked their preferences regarding whether local planners should work in a regional planning group or by themselves. A total of 42.8% of the respondents expressed a preference for regional planning cooperation. However, approximately 25% of all respondents favored local planners working by themselves. The responses for this question were significantly different by state ( $p=.00$ ). The New Hampshire respondents (40.4%) were relatively less willing to express opinions than were Vermonters (25.8%). Vermont respondents were evenly split in their preferences for strongly regional versus strongly local planning efforts, with 19.6% of the group selecting each of the two categories. On the other hand, Vermont respondents were much more likely to prefer local-regional planning cooperation than encouraging local planners to work alone.

### Participation in Outdoor Recreation Activities in a Multivariate Context

In an attempt to provide a more complete understanding of differences and similarities among the Vermont and New Hampshire residents, a series of multiple regression models were developed (one each for Vermont and New Hampshire residents and one combined model). Measures highlighted above, namely perceived seriousness of problems, attitudes towards local and regional planning efforts, and the various sociodemographic factors were used as the independent variables in the models (see Table 3).

Table 3: Comparative North Country Citizen Models Regression Parameters

PREDICTORS	MODELS		
	TOTAL	NH	VT
State of Residence	.15 <sup>1</sup> (3.56)		
Age	-.39 (-9.68)	-.41 (-6.18)	-.40 (-7.76)
Income	.09 (2.24)	.16 (2.50)	
Education	.18 (4.24)	.18 (2.63)	.24 (4.54)
Agr Land Preser.	.09 (2.22)		.14 (2.50)
Lakeshore Dev.	.16 (3.62)	.23 (3.46)	.13 (2.36)
ADJUSTED R <sup>2</sup>	.31	.31	.30

<sup>1</sup>/Standardized Regression Coefficients with standard errors in parentheses.

The dependent variable was an index of participation in outdoor recreation activity. In this index, participation was defined as occasional or frequent engagement of the various activities. This index ranged from 0 to 22 (either never participated in any activity or participated in 22 different activities) with a mean of 10 and a standard deviation of 5.

In general, all three models accounted for about the same amount of variance (roughly 30%). Each was also dominated by age (older people participate in fewer activities) and education (greater educational attainment is associated with greater recreational activity). However, some differences did emerge. The New Hampshire model was significantly impacted by income (the higher the income, the greater the activity) and by concern over lakeshore development (those with the greatest concern over development participated in more activities). The Vermont model, on the other hand, was impacted by concerns for agricultural land preservation and lakeshore development (where those with the greatest expressed concerns participated more frequently in outdoor recreational activities).

## Summary and Conclusions

North Country residents of New Hampshire and Vermont utilize their forest lands for a variety of recreational and economic activities. Results from this survey of the five-county region indicates that, while they share many concerns about the North Country region, residents differ in opinion about particular community problems and planning issues.

Three development related issues are mentioned most often: solid waste issues, population growth, and the impacts of development upon lakeshores, wildlife, and rivers and streams. Concerns were also expressed about the development of adequate sewer and water services. Vermont residents viewed the preservation of agricultural lands as a very serious problem, while New Hampshire residents voiced greater concern about the maintenance of an industrial wood supply and opportunities to participate in outdoor recreation.

State of residence had very limited effect upon types of recreational activities. Walking and driving for pleasure were listed as frequent outdoor activities for respondents from both states. Residents engaged, on average, at least 10 different outdoor recreation activities.

North Country respondents had strong opinions regarding growth and development and community planning efforts. Almost half of the respondents favored limitations to growth within their communities. However, Vermont and New Hampshire respondents differed in their attitudes. North Country Vermonters indicated a preference for controlled growth in much greater numbers than they did for encouraging growth. In contrast, New Hampshire respondents were more evenly divided with one-third favoring limits to growth and one-third encouraging growth.

In general, respondents were positive about their communities' planning efforts, although Vermonters were slightly more positive than New Hampshire residents. Respondents from both states were more positive about planning efforts in their own communities than about activities in neighboring communities. Although a sizeable portion (almost one in three) had not considered the concept, more than 40% of the respondents from both states were favorable toward the idea of local-regional planning cooperation. In Vermont, where much debate exists about regional planning activities, an equal number of respondents favored local planning versus those preferring local-regional planning cooperation.

## Implications for Policy Decisions

The results of this survey strongly support concern about issues of resource use and population growth. Policy makers can utilize a number of these findings in their planning activities:

Considerable concern in both states was expressed regarding solid waste issues. Problems of population growth and the impacts of development upon water resources and wildlife were also cited. Concern about local "infra-structure", in terms of providing water and sewer services, was also evident.

North Country Vermonters indicated a strong preference for controlled growth. New Hampshire respondents were more evenly divided between favoring limits to growth and encouraging growth. In general, respondents were positive about their communities' planning efforts. Although a sizeable portion of the respondents from both states were favorable towards the idea of local-regional planning cooperation, some skepticism for local-regional planning cooperation exists. Any effort to utilize local or regional planning mechanisms should be accompanied as well by public educational efforts.

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